

TRANSMITTAL LETTER OF THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		Attorney Docket No. 0513-1007 U.S. Application No. 10/089731
INTERNATIONAL APPLN. NO. PCT/FR00/02765	INTERNATIONAL FILING DATE 05 OCTOBER 2000 (05.10.00)	PRIORITY DATE CLAIMED 11 OCTOBER 1999 (11.10.99)
TITLE OF INVENTION: MEANS FOR HOLDING TWO PIECES IN POSITION REACTIVE TO EACH OTHER		
APPLICANT(S) FOR DE/EO/US: DANIEL DEMIT AND PATRICK GUILLOMET		
Applicant herewith submits to the United States Designated Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. 4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c)(2)) a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau) b. <input type="checkbox"/> has been communicated by the International Bureau. See attached PCT/IB/308. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)) a. <input checked="" type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11 to 20 below concern document(s) or information included: 11. <input checked="" type="checkbox"/> Information Disclosure Statement (IDS) w/PTO-1449 - <input checked="" type="checkbox"/> Copy of IDS citations 12. <input checked="" type="checkbox"/> Assignment Papers (cover sheet & document(s)) 13. <input checked="" type="checkbox"/> A FIRST Preliminary Amendment. 14. <input type="checkbox"/> A SECOND or SUBSEQUENT Preliminary Amendment. 15. <input type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A change of power of attorney and/or address letter. 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application (35 U.S.C. 154(d)(4)). 20. <input checked="" type="checkbox"/> Other items or information: <u>INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT/IIPEA/409), INTERNATIONAL SEARCH REPORT (PCT/ISA/210), APPLICATION DATA SHEET, ABSTRACT</u>		

U.S. APPLICATION NO. 107089731	INTERNATIONAL APPLN. NO. PCT/FR00/02765	ATTORNEY DOCKET NO. 0513-1007																								
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1)-(5): Neither international preliminary examination fee nor international search fee paid to USPTO and international Search Report not prepared by the EPO or JPO.....\$1040.00 International preliminary examination fee not paid to USPTO but International Search Report prepared by the EPO or JPO.....\$890.00 International preliminary examination fee not paid to USPTO but International search fee paid to USPTO.....\$740.00 International preliminary examination fee paid to USPTO but all claims did not satisfy provision of PCT Article 33 (1)-(4).....\$710.00 International preliminary examination fee paid to USPTO and all claims satisfied provision of PCT Article 33 (1)-(4).....\$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20- <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e))		CALCULATIONS PTO USE ONLY																								
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">CLAIMS</th> <th style="width: 15%;">NUMBER FILED</th> <th style="width: 15%;">NUMBER EXTRA</th> <th style="width: 15%;">RATE</th> <th style="width: 15%;"></th> <th style="width: 15%;"></th> </tr> </thead> <tbody> <tr> <td>Total Claims</td> <td>10 - 20 =</td> <td>0</td> <td>X \$18.00</td> <td>\$</td> <td></td> </tr> <tr> <td>Independent Claims</td> <td>1 - 3 =</td> <td>0</td> <td>X \$84.00</td> <td>\$</td> <td></td> </tr> <tr> <td colspan="3">MULTIPLE DEPEND CLAIM(S) (if applicable)</td> <td>+ \$280.00</td> <td>\$</td> <td></td> </tr> </tbody> </table>		CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			Total Claims	10 - 20 =	0	X \$18.00	\$		Independent Claims	1 - 3 =	0	X \$84.00	\$		MULTIPLE DEPEND CLAIM(S) (if applicable)			+ \$280.00	\$		
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Fee for recording the enclosed assigned (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) \$40.00 per property +		\$ 40.00																								
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<input checked="" type="checkbox"/> A Check in the amount of \$930.00 to cover all fees is attached. <input type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to Deposit account No. 25-0120 in the name of Young & Thompson, as described below. A duplicate copy of this sheet is enclosed. <input checked="" type="checkbox"/> The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fee required under 37 C.F.R. §§ 1.16 or 1.17.																										
SEND ALL CORRESPONDENCE TO: 745 South 23rd Street Arlington, VA 22202 Telephone (703) 521-2297 Y&T Customer No. 000466																										
BC/bam Date: April 4, 2002		SIGNATURE <u><i>Benoit Castel</i></u> Benoit Castel NAME 35,041 REGISTRATION NO.																								

PATENT
0513-1007

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of: Daniel DEMIT et al.

Appl. No.: **NEW**

Group:

Filed: April 4, 2002

Examiner:

For: MEANS FOR HOLDING TWO PIECES IN POSITION
RELATIVE TO EACH OTHER

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

April 4, 2002

Sir:

The following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

IN THE ABSTRACT OF THE DISCLOSURE:

Please replace the Abstract of the Disclosure with the rewritten Abstract of the Disclosure attached on a separate sheet attached hereto.

IN THE SPECIFICATION:

Please make the following insertions:

Page 1, between lines 6 and 7, please insert the following heading:

--BACKGROUND OF THE INVENTION--.

Page 2, between lines 14 and 15, please insert the following heading:

--OBJECTS AND SUMMARY OF THE INVENTION--.

Page 4, between lines 5 and 6, please insert the following heading:

--BRIEF DESCRIPTION OF THE DRAWINGS--

and between lines 30 and 31, please insert the following heading:

--DETAILED DESCRIPTION OF THE INVENTION--.

IN THE CLAIMS:

Please amend the claims as follows:

1/(Amended) Means for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions (D1, D2) that form a docking angle (β) between them, the position-holding means comprising firstly at least a male and a female V (19, 20) each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle, the female V possessing an inlet portion (20.1) having an aperture angle (α_1 , α) not less than the docking angle, and secondly means (23, 24) for pressing the male V against the female V along said bisector.

2/(Amended) Position-holding means according to claim 1, wherein the Vs (19, 20) have aperture angles (α) that are substantially equal and greater than the docking angle (β).

3/(Amended) Position-holding means according to claim 2, wherein for a docking angle (β) of about 90° , the aperture angles (α) of the Vs (19, 20) are equal to about 120° .

4/(Amended) Position-holding means according to claim 1, wherein the female V (20) possesses an end portion (20.2) having an aperture angle (α_2) substantially equal to the aperture angle of the male V (19) which is not less than the docking angle (β), and wherein the aperture angle (α_1) of the inlet portion (20.1) of the female V is greater than the aperture angle (α_2) of the end portion (20.2) thereof.

5/(Amended) Position-holding means according to claim 4, wherein, for a docking angle (β) substantially equal to 90° , the aperture angle (α_2) of the male V and of the end portion (20.2) of the female V (20) is substantially equal to 90° , and the aperture angle (α_1) of the inlet portion (20.1) of the female V (20) is substantially equal to 120° .

6/(Amended) Position-holding means according to claim 1, wherein the means for pressing the Vs together comprise a peg (23) projecting from the male V (19) symmetrically relative thereto so as to be inserted into an elongate slot (22) formed in the female V (20) and having a major axis contained in the plane of the docking direction, at least one jaw (24) being movably mounted on the peg (23) to be actuated between an active position in which it forms an abutment for a rear face (26) of the female V facing away from the male V, and an inactive position in which it is retracted and allows the peg to pass freely through the slot of the female V.

7/(Amended) Apparatus for assembling bodywork, the apparatus comprising two side tools (14) supporting body sides (2) and a tool (11) extending transversely relative to the two side tools, comprising means (18) according to claim 1 for holding the side tools and the transverse tool in position relative to one another, the transverse tool having at least two Vs (19) disposed symmetrically about a longitudinal axis of the bodywork and designed to co-operate with corresponding Vs (20) fixed to the side tools.

8/(Amended) Apparatus according to claim 7, wherein for a docking angle (β) of about 90° , the aperture angles (α) of the Vs (19, 20) are equal to about 120° , and wherein the bisector

(b) of the aperture angles (α) of the Vs (19, 20) forms an angle of about 45° with the longitudinal axis of the bodywork.

9/(Amended) Apparatus according to claim 7, wherein the Vs secured to the transverse tool (11) are male Vs (19) and the Vs secured to the side tools (14) are female Vs (20).--

Please add the following claim:

--10/(New) Apparatus according to claim 7, wherein, for a docking angle (β) substantially equal to 90° , the aperture angle (α_2) of the male V and of the end portion (20.2) of the female V (20) is substantially equal to 90° , and the aperture angle (α_1) of the inlet portion (20.1) of the female V (20) is substantially equal to 120° , and wherein the bisector (b) of the aperture angles (α) of the Vs (19, 20) forms an angle of about 45° with the longitudinal axis of the bodywork.--

REMARKS

Claims 1-10 are pending in the present application.
Claim 10 has been added.

Entry of the above amendments is earnestly solicited.
An early and favorable first action on the merits is earnestly requested.

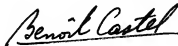
Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the claims and Abstract by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON



Benoit Castel, Reg. No. 35,041

745 South 23rd Street
Arlington, VA 22202
Telephone (703) 521-2297

BC/bam
Attachments

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE ABSTRACT OF THE DISCLOSURE:

The Abstract of the Disclosure has been amended as follows:

A B S T R A C T

MEANS FOR HOLDING TWO PIECES IN POSITION RELATIVE TO EACH OTHER

The invention provides ~~means~~ **members** for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions that form a docking angle between them, the holding ~~means~~ **members** comprises firstly at least a male and a female V (19, 20) each provided with ~~means~~ **elements** for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle and the female V possessing an inlet portion having an aperture angle not less than the docking angle, and secondly ~~means~~ **elements** (23, 24) for pressing the male V against the female V along ~~said the~~ bisector. ~~The invention also provides apparatus for assembling pieces of bodywork and incorporating such means.~~

~~Translation of the title and the abstract as they were when originally filed by the Applicant. No account has been taken of any changes that may have been made subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 27.2, 38.2, and/or 48.3.~~

IN THE CLAIMS:

The claims have been amended as follows:

1/ Means for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions (D1, D2) that form a docking angle (β) between them, the position-holding means ~~being characterized in that it comprises~~ comprising firstly at least a male and a female V (19, 20) each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle, the female V possessing an inlet portion (20.1) having an aperture angle (α_1 , α) not less than the docking angle, and secondly means (23, 24) for pressing the male V against the female V along said bisector.

2/ Position-holding means according to claim 1, ~~characterized in that~~ wherein the Vs (19, 20) have aperture angles (α) that are substantially equal and greater than the docking angle (β).

3/ Position-holding means according to claim 2, ~~characterized in that~~ wherein for a docking angle (β) of about 90° , the aperture angles (α) of the Vs (19, 20) are equal to about 120° .

4/ Position-holding means according to claim 1, ~~characterized in that~~ wherein the female V (20) possesses an end portion (20.2) having an aperture angle (α_2) substantially equal to the aperture angle of the male V (19) which is not less than the docking angle (β), and ~~in that~~ wherein the aperture angle (α_1) of the inlet portion (20.1) of the female V is greater than the aperture angle (α_2) of the end portion (20.2) thereof.

5/ Position-holding means according to claim 4, ~~characterized in that~~ wherein, for a docking angle (β) substantially equal to 90° , the aperture angle (α_2) of

the male V and of the end portion (20.2) of the female V (20) is substantially equal to 90° , and the aperture angle (α_1) of the inlet portion (20.1) of the female V (20) is substantially equal to 120° .

6/ Position-holding means according to ~~any one of claims 1 to 5, characterized in that~~ wherein the means for pressing the Vs together comprise a peg (23) projecting from the male V (19) symmetrically relative thereto so as to be inserted into an elongate slot (22) formed in the female V (20) and having a major axis contained in the plane of the docking direction, at least one jaw (24) being movably mounted on the peg (23) to be actuated between an active position in which it forms an abutment for a rear face (26) of the female V facing away from the male V, and an inactive position in which it is retracted and allows the peg to pass freely through the slot of the female V.

7/ Apparatus for assembling bodywork, the apparatus comprising two side tools (14) supporting body sides (2) and a tool (11) extending transversely relative to the two side tools, ~~the apparatus being characterized in that it comprises~~ comprising means (18) according to ~~any preceding~~ claim 1 for holding the side tools and the transverse tool in position relative to one another, the transverse tool having at least two Vs (19) disposed symmetrically about a longitudinal axis of the bodywork and designed to co-operate with corresponding Vs (20) fixed to the side tools.

8/ Apparatus according to claim 7, ~~as dependent on claim 3 or claim 5, characterized in that~~ wherein for a docking angle (β) of about 90° , the aperture angles (α) of the Vs (19, 20) are equal to about 120° , and wherein the bisector (b) of the aperture angles (α) of the Vs (19, 20) forms an angle of about 45° with the longitudinal axis of the bodywork.

9/ Apparatus according to claim 7 ~~or claim 8,~~
~~characterized in that~~ **wherein** the Vs secured to the
transverse tool (11) are male Vs (19) and the Vs secured
to the side tools (14) are female Vs (20).

A B S T R A C T

The invention provides means for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions that form a docking angle between them, the holding means comprises firstly at least a male and a female V (19, 20) each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle and the female V possessing an inlet portion having an aperture angle not less than the docking angle, and secondly means (23, 24) for pressing the male V against the female V along said bisector. The invention also provides apparatus for assembling pieces of bodywork and incorporating such means.

MEANS FOR HOLDING TWO PIECES IN POSITION RELATIVE TO EACH OTHER

The present invention relates to means for holding two pieces in position for fixing them together. Such position-holding means can be used, for example, to interlock two tools, or a tool and a tool support.

In assembly lines for motor vehicle bodywork, subassemblies (such as the subframe, the sides of the body, the rear panel, ...) are put into position relative to one another and relative to welding robots. Since bodywork pieces are naturally deformable when subjected to stresses, the tooling used for making bodywork of determined and reproducible shape performs two functions: firstly it constitutes reinforcement for each of the deformable subassemblies so as to stiffen them, and secondly it constitutes a stable interface providing accurate positioning in a fixed frame of reference defined relative to the welding robots.

In a recently developed method of building motor vehicle bodies, the step of assembling the bodywork includes a stage of putting two body sides and a rear panel into place and holding them in position in the frame of reference of the assembly station by means of two parallel side tools each co-operating with one of the sides of the body and by means of a transverse tool co-operating with the rear panel, the three tools being connected to one another and to the frame of reference of the assembly station in such a manner that the transverse tool is placed and held in said frame of reference in a position that is precise and locked, and in such a manner that it forms a spacing and bracing tool for the two tools that are parallel in a direction perpendicular thereto.

Depending on the type of body to be assembled, it is necessary either for the rear panel to be put into place initially so that the sides of the body can then come up on either side thereof, or else for the sides of the body

to be put into place initially so that the rear panel can then be fitted over the corresponding ends thereof. In addition, in order to increase productivity, it can be advantageous for the three tools to be capable of
5 engaging or disengaging mutually relative to one another simultaneously so as to save time. Unfortunately, known means for holding two pieces in position relative to each other allow for only one direction in which said pieces can be engaged relative to each other such that
10 incorporating such means in the above-described assembly station for interconnecting the tools would require the tools to be put into place successively at least to some extent and in a predetermined order. That limits the flexibility and the maximum productivity of the method.

15 The invention proposes means that are simple for holding two pieces in position while enabling the pieces to be brought towards each other in at least two extreme coplanar docking directions that form a docking angle between them.

20 According to the invention, the position-holding means comprises firstly at least a male and a female V each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking
25 angle, the female V possessing an inlet portion having an aperture angle not less than the docking angle, and secondly means for pressing the male V against the female V along said bisector.

30 Thus, each V provides a function of guiding and/or recentering the other V during the stage in which the two pieces are approaching each other, thus enabling the axes of the Vs to be brought into alignment, and a function of statically positioning the other V once the pieces have approached each other and are held in position by the
35 means pressing the Vs against each other.

According to a first particular characteristic, the Vs have aperture angles that are substantially equal and

greater than the docking about and, more particularly, for a docking angle of about 90° , the aperture angles of the Vs are equal to about 120° . Since the aperture angle of the Vs is greater than the docking angle,

5 uncertainties in the relative positioning of the Vs prior to coming into contact are of no consequence. This is particularly advantageous when the pieces are put into place by standard robots of medium positioning accuracy.

10 According to a second particular characteristic, the female V possesses an end portion having an aperture angle substantially equal to the aperture angle of the male V which is not less than the docking angle, and the aperture angle of the inlet portion of the female V is greater than the aperture angle of the end portion
15 thereof and, more particularly, for a docking angle substantially equal to 90° , the aperture angle of the male V and of the end portion of the female V is substantially equal to 90° , and the aperture angle of the inlet portion of the female V is substantially equal to
20 120° .

25 In a particular embodiment, the means for pressing the Vs together comprise a peg projecting from the male V symmetrically relative thereto so as to be inserted into an elongate slot formed in the female V and having a major axis contained in the plane of the docking
30 direction, at least one jaw being movably mounted on the peg to be actuated between an active position in which it forms an abutment for a rear face of the female V facing away from the male V, and an inactive position in which it is retracted and allows the peg to pass freely through the slot of the female V. The structure of the position-holding means is thus compact and relatively simple.

35 The present invention also provides apparatus for assembling bodywork, the apparatus comprising two side tools for supporting the body sides, a tool extending transversely relative to said two side tools, and means presenting one of the above-specified characteristics for

holding the side tools and the transverse tool in position relative to one another, the transverse tool having at least two Vs disposed symmetrically about a longitudinal axis of the bodywork and designed to co-operate with corresponding Vs fixed to the side tools.

Other characteristics and advantages of the invention will appear on reading the following description of particular, non-limiting embodiments of the invention.

Reference is made to the accompanying drawings, in which:

- Figure 1 is a diagrammatic perspective view of apparatus in accordance with the invention for assembling vehicle bodywork;
- Figure 2 is a fragmentary plan view showing a first mode of bringing together tools of the apparatus of the invention;
- Figure 3 is a view analogous to Figure 2 showing a second mode of bringing the tools together;
- Figure 4 is a perspective view of means for holding two tools in position, the means being shown while they are being brought together;
- Figure 5 is a fragmentary section through two tools held in position relative to each other;
- Figures 6 and 7 are a face view and a side view of a variant embodiment of the male V of the apparatus of the invention; and
- Figures 8 and 9 are views analogous to Figures 6 and 7 showing the corresponding variant embodiment of the female V.

The apparatus of the invention is for use in assembling vehicle bodywork comprising a subframe 1 of the vehicle body, two body sides 2, and a rear panel 3.

With reference to Figure 1, the assembly apparatus comprises a fixed structure 10 possessing an X, Y, Z frame of reference. A support for the subframe 1 of the motor vehicle body can be brought into this structure in

such a manner that the longitudinal axis 1' of the subframe 1 is parallel to the X direction. The means for bringing this support into the structure and putting it into position in the frame of reference are known in themselves and they are not shown. By way of example, the support can be constituted by a pallet which travels on a conveyor passing through the structure 10 along the X direction, with lifting means being provided in the structure to separate the pallet from the conveyor and put it into a reference position in the X, Y, Z frame.

The assembly apparatus comprises a transverse tool for co-operating with the panel 3 and two side tools for co-operating with the body sides 2.

The transverse tool is symbolized as a frame 11 extending transversely to the direction X and suitable for being coupled to the structure 10 via support studs 12, for example. In this case, the studs 12 co-operate with the frame 11 via four fixing points which enable the frame 11 to be held completely stationary in the structure 10 both in translation relative to the directions X, Y, and Z and in rotation about them. In this case, the frame 11 is fitted on one of its faces with gripping and handling means for use by a robot 13 handling the frame. On its other face, the frame 11 possesses clamps for co-operating with the panel 3.

The side tools are symbolized as frames 14 extending parallel to the Z direction and supported by the structure 10 via studs 15 which serve to fix the positions of the frames in the Z direction. Each frame 14 is fitted on one of its faces with gripping and handling means for engaging a robot 16 that handles it, and on its other face with clamps for co-operating with the corresponding body side 2.

The rear upright 17 of each frame 14 is connected to the frame 11 via position-holding means given overall reference 18 for holding the frames 14 in a vertical position that is spaced and braced by the frame 11, and

also for fixing the frames 14 in position along the X direction. In analogous manner, provision can be made for the frames 14 to constitute elements for locking the frame 11 in the X and Z directions, with the frame 11 co-
 5 operating directly with the structure 10 solely via a stud that prevents it from moving in the Y direction (e.g. by a Z-axis pilot).

The position-holding means 18 are arranged to enable the frame 11 to dock with each of the frames 14 in a
 10 direction D1 parallel to the Y direction and to enable the frames 14 to dock with the frame 11 in a direction D2 parallel to the X direction (see Figures 2 and 3). These two docking directions are coplanar and between them they form a docking angle β which in this case is equal to
 15 90° . The position-holding means also serve to enable the tools to dock in directions that are intermediate between the extreme directions D1 and D2.

With reference also to Figure 4, each position-holding means 18 comprises a male V 19 and a female V 20
 20 having an aperture angle α of about 120° . The aperture angle α of the Vs is not less than the docking angle and is preferably greater than it.

The transverse tool is associated with two male Vs 19 disposed symmetrically about the axis 1' so that each
 25 co-operates with a respective one of the side tools. Each male V 19 is secured to the frame 11 in such a manner as to be centered on a direction parallel to the bisector of the docking angle, i.e. specifically the bisector b of the aperture angle α forms an angle of 45°
 30 with the X and Y directions and extends in a plane parallel to the plane containing said X and Y directions.

Each of the female Vs 20 is secured to one end of an arm 21, itself secured to the rear upright 17 of the
 35 corresponding frame 14 so as to form an angle of 45° relative to the X and Y directions. Like the male Vs 19, the female Vs 20 are mounted in such a manner as to be centered on a direction parallel to the bisector of the

docking angle, i.e., in this case, the bisector \underline{b} of the aperture angle α of a female V forms an angle of about 45° with the X and Y directions and is coplanar therewith. An elongate slot 22 having a major axis 22' contained in the plane of the docking directions is formed transversely in each female V 20.

Each position-holding means 18 also includes means for pressing the male V 19 against the female V 20 along the bisector of the docking angle β and the bisector \underline{b} of the aperture angles α .

This means comprises a peg 23 projecting from the male V 19 along the bisector \underline{b} , symmetrically about the bisector, and parallel to the bisector of the docking angle. Two jaws 24 are movably mounted on the peg 23 to be actuated in conventional manner by a control rod 25 (formed by the rod of an actuator that is not shown) to move between an active position in which they project laterally from the peg 23 (Figure 5) and an inactive position in which they are retracted into the peg 23 (Figure 4).

In operation, the frames 11 and 14 and the corresponding bodywork elements 3 and 2 can be caused to co-operate at the time when the frames 11 and 14 are put into place in the structure 10 of the station, the panel 3, the subframe 1, and the body side 2 previously put into place in the structure of the apparatus then being preassembled. The clamps of the frames 11 and 14 can also constitute means for coupling the frame 11, 14 with the corresponding bodywork elements 3, 2 that are put into operation outside the assembly line, in which case the frame 11, 14 constitutes a kind of pallet for transporting the corresponding bodywork element 3, 2 and the robot 13, 16 serves to put the pallet into place in the apparatus.

In a first mode of docking the tools together as shown in Figure 2 and corresponding to bodywork of a type in which the body sides 2 are brought up to the panel 3,

the frame 11 is put into place in the structure 10 before the frames 14, and these frames are subsequently brought up to the frame 11 along the direction D1 parallel to the Y direction.

5 In a second docking mode shown in Figure 3 and corresponding to bodywork of a type in which the panel 3 is brought up against the rear ends of the body sides 2, the frames 14 are put into place in the structure 10 before the frame 11, which frame is then brought up to the frames 14 along the direction D2 parallel to the X direction.

In a third docking mode, the frames 11 and 14 are moved towards one another simultaneously.

During the docking stage, the peg 23 of each means 15 18 is inserted into the slot 22 of the corresponding female V 20 and moved along the slot until the male V 19 is received in the female V 20. The jaws 24 are moved into their active positions so that they bear against the rear face 26 of the female V 20 in which the male V 19 is engaged, thereby applying traction force on the male V 19 which is pressed against the female V 20 in a direction 20 parallel to the bisector b of the aperture angle α of the Vs (see Figure 5), thus forming an abutment for the rear face 26. It will be observed that the aperture angle α 25 of the Vs and the materials used for making the Vs (in this case steel) are determined in such a manner as to enable the contacting faces of each V to slide over one another during the stages of docking the Vs and pressing them one against another. The angle between the normal 30 to these faces and the direction in which the force pressing the Vs against one another is applied is thus greater than the friction angle of the materials used for making the Vs.

The rear portions of the body sides 2 and the panel 35 3 are thus accurately positioned relative to the subframe 1 and this is done in a manner that is very rigid using means that are simple and lightweight.

The portions of the frames 14 remote from the uprights 17 are not prevented from moving in the Y direction. They can thus be moved towards each other by exerting a force in the Y direction on said front portions. Extensions (not shown) parallel to the Y direction and secured to the frames 14 constitute means enabling them to press against each other, thereby limiting the extent to which they can be moved towards each other and enabling them to be connected together.

Thereafter, the subframe 1, the body sides 2, and the rear panel 3 are connected together or additional connections are made between them by spot-welding using robots that are not shown. Roof panels and cross-members (not shown) can be put into place between the body sides in the same station or in a following station. This can be done merely by placing the roof structure, i.e. the roof panel and the cross-members, between the cant rails (top portions) of the body sides 2 by means of a frame-like member, and then moving the body sides towards each other and thus against the roof structure, after which welding can be performed.

In a variant shown in Figures 6 to 9, each female V 20 has an inlet portion 20.1 with an aperture angle α_1 equal to 120° and an end portion 20.2 with an aperture angle α_2 equal to the docking angle β , i.e. 90° .

Each male V 19 has an aperture angle α equal to the docking angle β and to the aperture angle α_2 , i.e. 90° in this case.

The inlet portion 20.1 of the female V 20 thus performs a dynamic guidance function on the male V 19 during the docking stage, while the end portion 20.2 of the female V 20 serves essentially to perform the function of positioning the male V 19 during active positioning by means of the jaws 24.

It should be observed that the male V 19 has two opposite transverse parallel faces 27 and that the female V has two transverse parallel faces 28 facing each other

on either side of the slot 22. When the Vs are mounted on the corresponding tools, the faces 27 and 28 are perpendicular to the Z direction such that when the male V 19 is pressed against the female V 20 the faces 28 bracket the faces 27 so as to prevent the male and female Vs from moving relative to each other in the Z direction. This serves to provide relative positioning of the tools in the Z direction.

Naturally, the invention is not limited to the embodiment described and various embodiments can be provided without going beyond the ambit of the invention as defined by the claims.

In particular, the position-holding means can include additional male and female Vs for providing relative positioning of the tools in the Z direction, or the male and females Vs can have conical portions.

In addition, different aperture angles can be used for the Vs, such angles being determined in particular as a function of the magnitude of the docking angle.

It is also possible to provide for the transverse tool of the assembly apparatus not to co-operate with any bodywork element and to perform solely the function of spacing and bracing the side tools.

Finally, the position-holding means of the invention is not limited to the application described relating to the assembly apparatus, and can be employed for holding in position any type of piece that is being handled, in particular pieces that are handled by robots in order to be moved towards each other along two extreme docking directions.

CLAIMS

- 1/ Means for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions (D1, D2) that form a docking angle (β) between them, the position-holding means being characterized in that it comprises firstly at least a male and a female V (19, 20) each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle, the female V possessing an inlet portion (20.1) having an aperture angle (α_1 , α) not less than the docking angle, and secondly means (23, 24) for pressing the male V against the female V along said bisector.
- 2/ Position-holding means according to claim 1, characterized in that the Vs (19, 20) have aperture angles (α) that are substantially equal and greater than the docking angle (β).
- 3/ Position-holding means according to claim 2, characterized in that for a docking angle (β) of about 90° , the aperture angles (α) of the Vs (19, 20) are equal to about 120° .
- 4/ Position-holding means according to claim 1, characterized in that the female V (20) possesses an end portion (20.2) having an aperture angle (α_2) substantially equal to the aperture angle of the male V (19) which is not less than the docking angle (β), and in that the aperture angle (α_1) of the inlet portion (20.1) of the female V is greater than the aperture angle (α_2) of the end portion (20.2) thereof.
- 5/ Position-holding means according to claim 4, characterized in that, for a docking angle (β) substantially equal to 90° , the aperture angle (α_2) of

the male V and of the end portion (20.2) of the female V (20) is substantially equal to 90° , and the aperture angle (α_1) of the inlet portion (20.1) of the female V (20) is substantially equal to 120° .

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6/ Position-holding means according to any one of claims 1 to 5, characterized in that the means for pressing the Vs together comprise a peg (23) projecting from the male V (19) symmetrically relative thereto so as to be
 10 inserted into an elongate slot (22) formed in the female V (20) and having a major axis contained in the plane of the docking direction, at least one jaw (24) being movably mounted on the peg (23) to be actuated between an active position in which it forms an abutment for a rear
 15 face (26) of the female V facing away from the male V, and an inactive position in which it is retracted and allows the peg to pass freely through the slot of the female V.

20 7/ Apparatus for assembling bodywork, the apparatus comprising two side tools (14) supporting body sides (2) and a tool (11) extending transversely relative to the two side tools, the apparatus being characterized in that it comprises means (18) according to any preceding claim
 25 for holding the side tools and the transverse tool in position relative to one another, the transverse tool having at least two Vs (19) disposed symmetrically about a longitudinal axis of the bodywork and designed to co-operate with corresponding Vs (20) fixed to the side
 30 tools.

8/ Apparatus according to claim 7, as dependent on claim 3 or claim 5, characterized in that the bisector (β) of the aperture angles (α) of the Vs (19, 20) forms an angle
 35 of about 45° with the longitudinal axis of the bodywork.

9/ Apparatus according to claim 7 or claim 8, characterized in that the Vs secured to the transverse tool (11) are male Vs (19) and the Vs secured to the side tools (14) are female Vs (20).

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A B S T R A C T

MEANS FOR HOLDING TWO PIECES IN POSITION RELATIVE TO EACH OTHER

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The invention provides means for holding two pieces in position that are to be moved towards each other along at least two extreme coplanar docking directions that form a docking angle between them, the holding means comprises firstly at least a male and a female V (19, 20) each provided with means for fixing to a respective one of the pieces so that each V is centered substantially on a direction parallel to the bisector of the docking angle and the female V possessing an inlet portion having an aperture angle not less than the docking angle, and secondly means (23, 24) for pressing the male V against the female V along said bisector. The invention also provides apparatus for assembling pieces of bodywork and incorporating such means.

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Translation of the title and the abstract as they were when originally filed by the Applicant. No account has been taken of any changes that may have been made subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 37.2, 38.2, and/or 48.3.

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FIG. 1

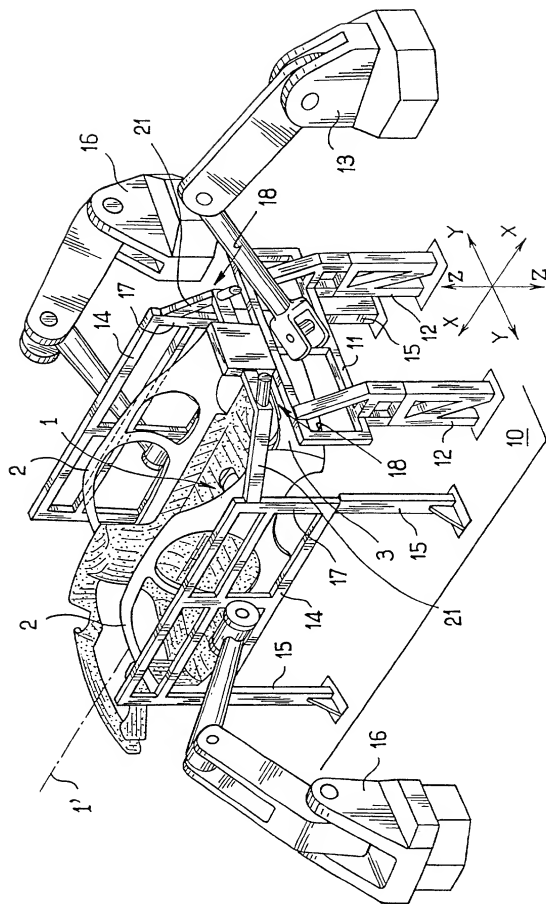


FIG. 2

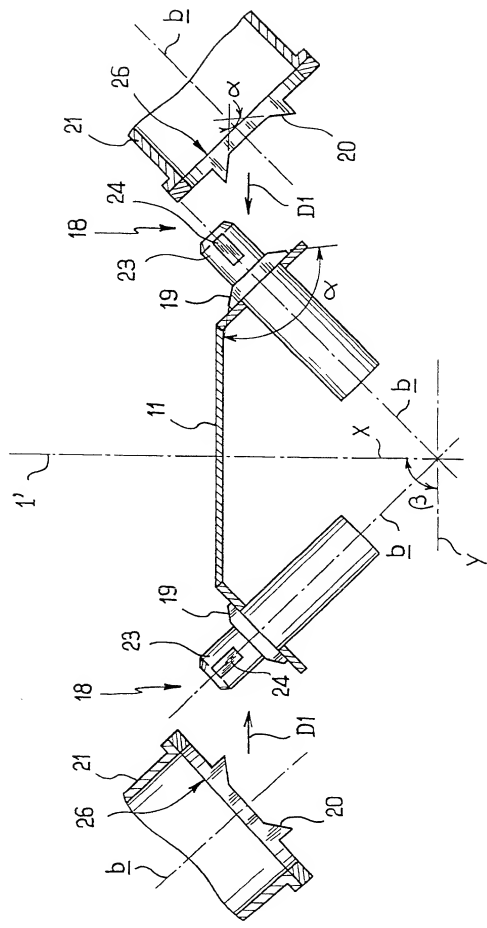
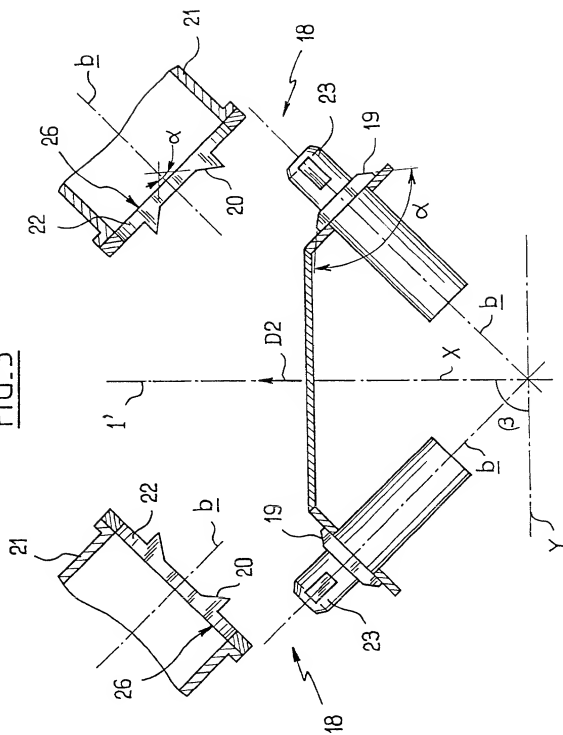


FIG. 3



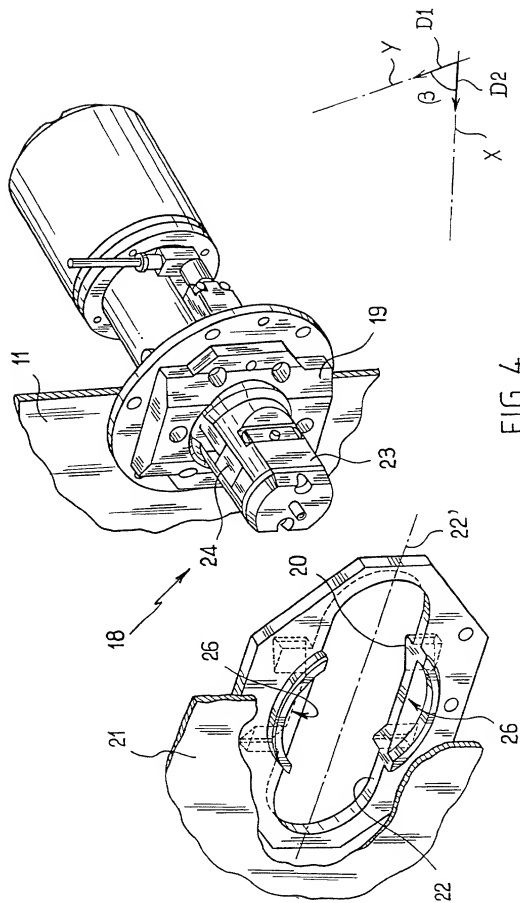
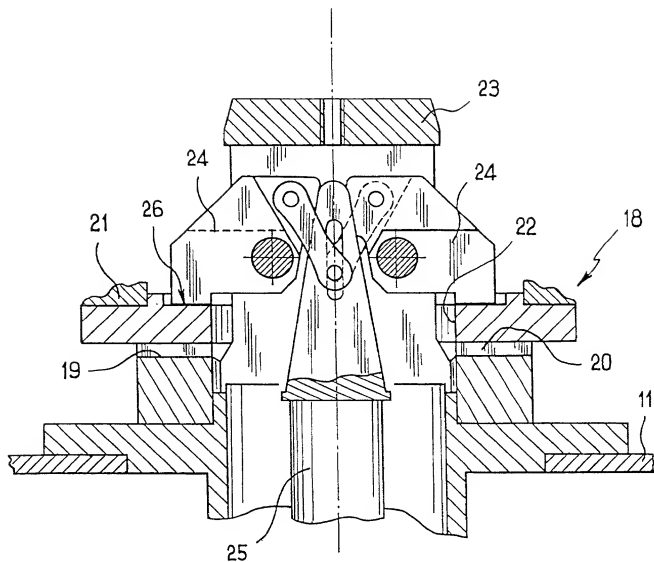
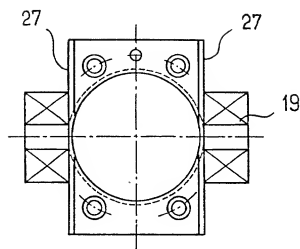
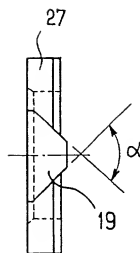
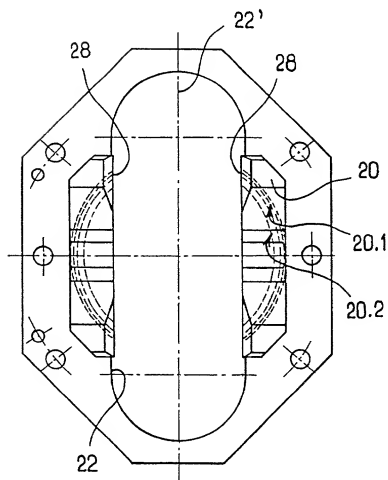
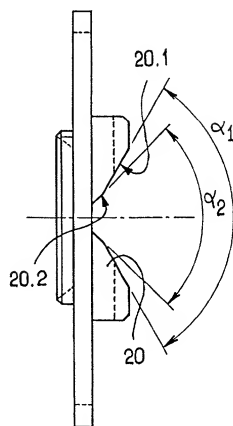


FIG. 4

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FIG. 5

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FIG. 6FIG. 7FIG. 8FIG. 9

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **MEANS FOR HOLDING TWO PIECES IN POSITION RELATIVE TO EACH OTHER**

the specification of which: (check one)

REGULAR OR DESIGN APPLICATION

☐ is attached hereto.

☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

☒ was described and claimed in International application No. PCT/FR00/02765 filed on October 5, 2000 and as amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
France	99 12620	11/10/1999	YES

(Complete this part only if this is a continuing application.)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status—patented, pending, abandoned)

POWER OF ATTORNEY

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the registered patent attorneys represented by Customer No. **000466** to prosecute this application and transact all business in the Patent and Trademark Office connected therewith, including: **Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoît CASTEL, Reg. No. 35,041, Thomas W. PERKINS, Reg. No. 33,027, Roland E. LONG, Jr., Reg. No. 41,949 and Eric JENSEN, Reg. No. 37,855.**

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature _____ Date _____

Residence: _____ Citizenship: _____

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Full name of fourth joint inventor:
(given name, family name)

Inventor's signature _____ Date _____

Residence: _____ Citizenship: _____